

What is claimed is:

SUB 1. A method of manufacturing a semiconductor device comprising the steps of:

5 forming an impurity diffusion layer in a semiconductor substrate;

forming a first insulating film covering the semiconductor substrate;

forming a lower electrode of a capacitor on the first insulating film;

10 forming an oxide dielectric film of the capacitor on the lower electrode;

forming an upper electrode of the capacitor on the oxide dielectric film;

15 forming a second insulating film for covering the capacitor;

forming a first opening on or above the impurity diffusion layer and a second opening on the upper electrode in the first and second insulating films, by etching a part of the second insulating film and a part of the first insulating film;

20 forming an oxidation-preventing metal film on the second insulating film for connecting electrically the diffusion layer via the first opening and the upper electrode via the second opening;

25 forming a local interconnection in a range which pass through the first opening and the second opening and contains at least a region where the upper

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5. A method of manufacturing a semiconductor device according to claim 1, wherein the step of forming the capacitor comprises the steps of,

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1 patterning the oxide dielectric film and the lower electrode,

forming an intermediate insulating film for covering the oxide dielectric film and the lower electrode,

5 forming a window, which is employed to define the capacitor region, in the intermediate insulating film by patterning the intermediate insulating film, and

forming the upper electrode at least in the window.

10 6. A method of manufacturing a semiconductor device according to claim 1, wherein the second insulating film for covering the capacitor or the third insulating film is a silicon oxide film which is formed by using silane.

15 7. A method of manufacturing a semiconductor device according to claim 1, wherein the second insulating film is a silicon oxide film which is formed by using organic silicon compound source.

20 8. A method of manufacturing a semiconductor device according to claim 7, wherein the organic silicon compound source is tetra ethoxy silane.

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25 9. A method of manufacturing a semiconductor device according to claim 1, wherein the oxide dielectric film is oxygen-annealed before and/or after the upper electrode of the capacitor is formed.

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F1 7 10. A method of manufacturing a semiconductor device according to claim 1, further comprising the

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step of oxygen-annealing the oxide dielectric film via the second opening and the upper electrode after forming the second opening.

11. A method of manufacturing a semiconductor device according to claim 1, wherein the upper electrode is formed of a noble metal or a conductive ceramic which is not oxidized by ^{an} the oxygen-annealing.

12. A method of manufacturing a semiconductor device according to claim 11, the noble metal is one of platinum, iridium or ruthenium.

13. A method of manufacturing a semiconductor device according to claim 1, wherein the oxide dielectric film is formed of PLZT, PZT, (Ba,Sr)TiO₃, Pb(Zr,Ti)O₃, (Pb,La)(Zr,Ti)O₃, SrBi₂Ta₂O₉ or Ta₂O₃.

14. A method of manufacturing a semiconductor device according to claim 1 further comprising the step of:

forming a conductive plug between the oxidation-preventing metal film and the ^{impurity} diffusion layer in the first opening.

15. A method of manufacturing a semiconductor device according to claim 14, wherein the conductive plug is formed of tungsten.

16. A method of manufacturing a semiconductor device according to claim 1, wherein the impurity diffusion layer is a component part of an MOS transistor.

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a third insulating film for covering the local interconnection.

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a conducting plug formed between the impurity diffusion layer and the upper electrode in the first opening.

19. A semiconductor device according to claim 17,

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wherein the local interconnection is composed of metal nitride.

20. A semiconductor device according to claim 19,
wherein the metal nitride is one of titanium nitride,
5 tungsten nitride or titanium-tungsten nitride.

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